

The Reciprocating Steam-engine

Introduction

The steam-engine is a prime mover, which may be defined as any contrivance for the production of mechanical work by utilizing one of the non-vital forces of nature. The force must be exerted against a yielding resistance, and, in general, it may be regarded as a pressure. The product of the pressure, and the distance through which the resistance is moved at the point of application, is a measure of the work done.

The ancients understood that fluid pressure could readily be obtained by the application of heat to a closed vessel containing water, the vapour produced exerting a pressure in all directions on the sides of the vessel, and that the vapour might be condensed by the application of cold, leaving a vacuum space above the cooled water.

A number of experimenters endeavoured to make use of these physical facts, but the first to produce a working apparatus was Savery, who, towards the end of the seventeenth century, patented an arrangement for pumping water.

Briefly described, it consisted of a boiler, in which high-pressure steam was generated, and a vessel communicating, at the lower portion, with a suction pipe and a rising discharge main. Steam from the boiler was admitted to the vessel, driving out the air through the discharge valve. The steam was shut off, and then condensed by allowing cold water to flow over the outer surface of the vessel. As soon as the pressure inside became sufficiently reduced, water from the suction pipe began to flow in, completing the condensation, and when the vessel was judged to be full of water, steam was again admitted, and the water forced out through the discharge valve. The steam contained in the vessel was then condensed as before, and the process repeated. The steam supply was regulated by hand, the suction and the discharge valves being automatic in action, exactly as in an ordinary plunger pump.

This simple apparatus, which could hardly be called an engine, was exceedingly wasteful. The steam was in direct contact with the water to be pumped and with the sides of the vessel containing the cold water, and much of it was condensed uselessly. The height to which the water could